

the copper to protect them from the teredo. The railway used in the filling process occupy the position they will finally have in tying together the different establishments with the Panama Railroad.

The houses of the employes will be on the outer line of the *Terre-plein* facing the sea; they are in two rows, forming a street called *Charles de Lessups*, in honor of the voyage made by the son of the president of the company to the Isthmus. These houses are of three types, intended for one, two or four employes. The smallest have two rooms, a kitchen and verandah, with the entire ground floor raised somewhat. The second type is really formed of two abutting houses of the first kind; the third is like No. 2, with the addition of a second story. The living rooms are 10 x 13 ft. in all cases, the kitchen is 10 x 8 ft.

We might here add that the Panama Wharf (No. 5) has been bought and repaired, and being now united by a special track to the *Terre-plein*, forms an important annex.

Dredging of the Port.—The present purpose of this dredging is to allow ships to approach the side of the *Terre-plein*, and to open up a passage for the transport of the material, etc., needed in digging the canal. So far the dredging has been delayed by frequent boisterous seas in the waters to be deepened, and before the construction of the mole there was no shelter in case of bad weather. The marine dredges, of which we made mention before, will do good service, on account of their dimensions, shape of hull, and above all, the facility with which they can move themselves by their propellers, riding the waves or seeking shelter when the seas become too heavy. But in the absence of these machines, taking advantage of calm weather and the shelter of the mole measured by the rate of its advancement, the dredges mounted at Colon have been utilized. Two of these have been pretty regularly at work; each moving from 1,100 to 1,300 cu. yds. per day. The coral reefs have several times arrested work; when one of these is met with, charges of dynamite are exploded upon the surface, which disintegrates the mass sufficiently for the dredges to remove the debris.

The map shows the area dredged out at the end of February, 1883; the depth attained is 16½ ft. The dredges are now deepening that part of Folka River lying against the railroad jetty. This will be an excellent harbor for all the naval outfit, and slips for repairs will be located upon the corresponding bank of the *Terre-plein*.

Dredging of the Canal.—At the point where the company's dredges stop work commences the canal proper. From this point to Gatun the excavation has been let by contract to Huerne, Slaven & Co., of San Francisco, Cal. The principal clauses of their contract are as follows:

The contractors are to furnish all their own material; to commence work in August, 1882, and to be in full working order three months thereafter, that is to say, to handle in December 12,000 cubic yards of material per day.

The digging is to progress in three successive stages the first cut to be 82½ ft. wide at the water surface and 3 ft. deep, to assure speedy communication with Gatun. The second excavation will make the depth of water 15 ft.; the third will reach the final depth of 23 ft. and the completed width of 165 ft. at water level.

These three stages of excavation to be finished as follows: The first, one year from the day fixed for the commencement of the work, the others, 2½ years after this same day.

The price paid per cubic meter (1½ cu. yds.) dredged, up to 6,000,000 cubic meters, is one franc fifty centimes (30 cents). For all dredging exceeding the quantity above named the price per cubic meter is reduced to 1½ francs (25 cents). In case the ground should require the use of powder, special contracts will be made for such excavations. To judge of the manner in which Messrs. Huerne & Slaven will execute the work undertaken by them, it will be necessary to wait and see them at work.

We are obliged to admit that at present they seem to attach little importance to several clauses of their contract. In fact, the first dredge, which ought to have been at work in August, 1882, only arrived at Colon in April, 1883. The contract period of active work commenced in December last, when three dredges should have been in operation, handling 12,000 cu. yds. of material per day, as yet, not an actual hour's work has been done. Will the promises made for the completion of each of the successive stages of the contract be better kept? We doubt it, especially in view of the fact that the first cut was to be finished in August next.

The American journals have given certain dimensions to

these dredges which do not seem to accord with the work to be done. The Huerne dredges, which are of the endless chain type, are 100 ft. long, 60 ft. wide, and 12 ft. depth of hold. They have to dig a canal in solid ground, and in consequence must open a way large enough to enable them to swing from side to side without touching, with the angles of the hull, either slope. The first trench to be dug will be 82½ ft. wide at the water surface, and will have a bottom width of only 56 ft., that is 4 ft. less than the width of the hull of the dredger. The dredge will thus find itself, so to say, boxed up in the ditch, without being able to execute the swinging movements necessary to advance the digging. It is true that the contractors, in constructing machines capable of digging out the canal to its full width in one operation will not be compelled to work in a ditch where the circulation of the company's material would always be troublesome to them.

To finish our description of the Colon section we must now go to Gatun, where a company's dredge arrived in April, 1883, by way of the Chagres. This is now at work on a cut destined to divert the waters of the Chagres to the west of the Indian village and the canal. This done, floods will no longer effect the trench of the canal; and later, when the waters of the Chagres itself will have been thrown back toward the other bank—that is to say, on the side of the railroad—this new channel will catch all the streams flowing in on the left bank.—*Engineering News and American Contract Journal.*

Inventions.

A NEW KIND OF MOUNTAIN ROAD.—An exchange says that a tramway is to be built up Pike's Peak, which will overshadow the Mount Washington railway. The plan is to construct three of these tramways, each nearly three miles long, one beginning at the end of the other. The first will start at the rear of the iron springs, at Manitou, Col., and the last will be terminable in front of the signal station on Pike's Peak, an elevation of 14,200 feet. The supports will be made of trees not less than eight inches in diameter, and about twenty-four feet high, braced above and below. On these an endless wire cable, of one inch bore, will revolve, and upon which will be fastened, at intervals of about 100 feet each, a large covered armchair, in which two persons can comfortably sit. This will be suspended about eight feet from the ground, and pass at entering and discharging points along a movable platform to load and unload, without stopping. The lower section will be propelled by an engine at the lower end. The centre one will be driven by water power, utilized on the mountain side through a turbine wheel, and the third by an engine erected on the summit of the peak.

MID-OCEAN TELEGRAPHY.—The idea of telegraphing from ships at sea is not a new one, and crops up from time to time. Mid ocean telegraph stations have been proposed and will probably be carried out some day. The chief difficulty in the way of their adoption has hitherto been the necessity of keeping the ship connected by a branch cable to the main cable lying on the bottom, and anchoring her so as to maintain this communication in all weathers and depths desirable. But Professor A. E. Dulbear has proposed a plan which may render this fixed communication unnecessary. A large metal plate attached to an insulated conductor is lowered from the ship to the bottom on the track of the cable and another plate is merely submerged. Between these two plates a battery and Morse key is inserted. On working the key the Morse currents induce other currents in the cable, which can be heard in telephones attached to the cable on shore.

MILL-ENGINES.—The Southwark iron foundry has constructed for Messrs. Cheney Brothers of South Manchester, Conn., a compound "Porter-Allen" engine, having steam-cylinders 12 and 21 inches diameter, 2-foot stroke, to run at 180 revolutions per minute. The power is given at 200 horse-power. The ratio of expansion is 16. The expenditure of water was 18.5 pounds per horse-power and per hour. Of this, 11.75 was accounted for by the indicator: the rest was wasted by condensation in the steam-cylinders and by leakage. In these engines the low pressure cylinder is steam-jacketed, and the exhaust from the high-pressure cylinder passes into an intermediate reservoir, from which the large cylinder is supplied. The reservoir acts as a separator for the water carried in with the steam; and this water is trapped off, and does not reach the low-pressure cylinder.